

WIND POWER PREDICTION USING ARTIFICIAL NEURAL NETWORK

Thesis presented in partial fulfillment of the requirement for
Bachelor of Engineering (Hons) in Electrical
UNIVERSITI TEKNOLOGI MARA

SEPTONY EDIK
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, MALAYSIA
NOVEMBER 2010

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ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude to The Almighty God for His blessings upon me through such a wonderful project and giving me the strength and opportunity to complete this project. Also, I would like to express my gratitude to my project supervisor, Ms. Dalina Binti Johari for her kindness, supportive comments, guidance and suggestions, and her willingness to share her invaluable knowledge with me. She indeed gave a lot of assistance in helping me to be more familiar to the concept of Artificial Neural Network (ANN) and to acquire better understanding of the languages used in the program.

There were actually numbers of people who had lent kind helping hand to me in accomplishing my project in either direct or indirect ways. A huge appreciation goes to my seniors who were sharing lots of useful information, ideas and their invaluable experience in the completion of my project. I also want to thank my friends for being a good motivator and giving a good morale supports. How should I express my deepest gratitude to my family members for their passion to support me during my hard times and even being my financial sources during the complement of the project?

Last but not least, a hearty thanks to all, who had provided me with tremendous assistance, no matter direct or indirect in the completion of this project. In fact, I could not have completed this project without them. God bless you all!!

Thank you.

ABSTRACT

This project reports the application of Artificial Neural Network (ANN) in wind power prediction based on historical meteorological data. ANN which is inspired by the functional aspects of biological neural networks is employed in this project due to its strong pattern recognition capabilities and its ability to model flexible linear or non-linear relationship among variables. A three layers feed-forward back-propagation neural network has been developed to predict the wind power for the next hour. In order to get an accurate wind power prediction, several network structures, training algorithms and transfer functions have been developed and tested with different sets of data. The performance of a network will be determined by its convergence capability, and only the network with the best performance will be selected. As a result, an ANN with the regression value of 0.81881 was developed, which has the ability to predict the wind power for the next hour with 81.881 % accuracy.

TABLE OF CONTENTS	Page
ACKNOWLEDGEMENTS...	i
ABSTRACT	ii
TABLE OF CONTENTS ...	iii
LIST OF FIGURES.....	v
LIST OF TABLES	vi
CHAPTER 1: INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	3
1.3 Project Objectives	3
1.4 Scope of Work	4
1.5 Thesis Organization	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction to Wind	5
2.2 Technical Aspects of Wind	6
2.2.1 Causes of Wind	6
2.2.2 Types of Wind	8
2.3 Wind Circulation of Peninsular Malaysia	14
2.4 Introduction to Artificial Neural Networks (ANN)	17
2.4.1 What Is an Artificial Neural Network?.....	17
2.4.2 Historical Background	18
2.4.3 Potentials of Neural Networks	18
2.5 Neural Networks versus Conventional Computers Technique	19
2.6 Human and Artificial Neurons- Investigating the Similarities	20
2.6.1 How the Human Brain Learns?.....	20
2.6.2 Human Neurons to Artificial Neurons	21
2.7 Properties of Artificial Neural Networks	23
2.7.1 Back-propagation ANN.....	23
2.7.2 Feed Forward Back-propagation	23

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Wind power is a kind of clean, pollute-free renewable energy power generation. Wind power can be defined as the conversion of wind energy into a useful form of energy, such as using wind turbines to make electricity, wind mills for mechanical power, wind pumps for pumping water or drainage, or sails to propel ships.

Wind energy conversion systems appear as an attractive alternative for electricity generation. However, at the same time, the integration of wind farms in power networks has become an important problem for the unit commitment and control of power plants in electrical power systems [1]. The intermittent nature of wind makes it difficult to forecast wind-produced electric energy in a wind farm even in the next hours. Therefore, an accurate wind power prediction system is really important to guarantee the size of power production in the next hour.

Several methods to predict wind power have been reported, namely physical and statistical methods. The physical method requires a lot of physical considerations to reach the best prediction precision. For a physical model, the input variables will be the physical or meteorology information, such as description of orography roughness, obstacles, pressure, and temperature [1]. The statistical method aims at finding the relationship of the on-line measured power data. For a statistical model, the historical data of the wind farm may be used [1].